FETC SUCCESS

U.S. Department of Energy
Federal Energy Technology Center

ENVIRONMENTAL MANAGEMENT

- ☐ fossil energy
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Well Injection Depth Extraction (WIDE) Soil Flushing Using Prefabricated Vertical Wells (PVWs)

States Impacted:
West Virginia, Ohio

Benefit Areas:
Environmental Quality Improved, New Application of Existing Technology

Participants:
Federal Energy Technology Center, North Carolina State University, DOE Ashtabula Environmental Management Project, NILEX Corporation, RMI Environmental Services

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Description

Contaminated soil has conventionally been cleaned by excavating and chemically or thermally cleaning the soil, and then returning it to the site, or by using a soil flushing process in situ. The in situ process is limited by how well the contaminant is extracted, how well it is solubilized in the flushing solution, and how effectively the flushing solution moves through the soil. For fine-grained soils, such as silts and clays, extracting the contaminant from the soil and moving the flushing solution through the soil are more difficult than when dealing with coarse-grained soils, such as sands. As a result, soil flushing is not always the most effective way to remediate contaminated aquifers, and a pump-and-treat system may be prohibitive because it would require a long remediation time.

As part of the Federal Energy Technology Center's (FETC's) Industry and University Programs, North Carolina State University is conducting research and development for the Well Injection Depth Extraction (WIDE) Soil Flushing technology. The WIDE technology incorporates a system of Prefabricated Vertical Wells (PVWs) for *in situ* remediation of contaminated sites where fine-grained soils are present. The WIDE system shortens the drainage path of groundwater flow and promotes subsurface liquid movement, accelerating the soil flushing process. Field demonstrations of the WIDE system involve installation of a triangular grid of PVWs placed in off-set rows of injection/extraction lines at relatively close spacing, less than 1 meter. PVWs can be installed at rates of up to 3 m/s in firm clay soils using conventional pump- and-treat technology.

Goals

This effort involves developing a soil remediation technology that can be used in fine-grained soils, which can limit how well the contaminant can be extracted from the soil and how well the flushing solution moves through the soil.

Tangible Benefits

National: The WIDE system offers superior advantages over conventional pump-and-treat systems using well galleries and deep excavation cut-off trenches. The PVWs are designed to work for depth specific extraction of contaminated plumes with or without concurrent liquid injection. The PVWs are manufactured largely from existing off-the-shelf components, thereby minimizing cost and time concerns associated with custom fabrication/manufacturing and specialized labor.

Regional/Local: The WIDE system has been tested at two locations: an Ashland Petroleum Gas Station site in Weston, WV; and the Department of Energy's Ashtabula Environmental Management Project (AEMP) in Ashtabula, OH. At the Ashland petroleum site, the WIDE system was able to successfully cleanup benzene, toluene, ethyl benzene and xylene (BTEX) groundwater contamination. Results of the pilot- and field-scale testing indicated effective contamination removal as a function of time at sustained flow rates. Similarly, at DOE's Ashtabula site, soil and groundwater contamination from trichloroethylene (TCE), Uranium, and Technetium 99 (Tc99), residuals from a uranium metals processing facility, were effectively removed.

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